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5. The material of claim 1 wherein the inorganic particles have an average secondary particle diameter less than about 100 nm and the primary particles having a distribution in sizes such that at least about 95 percent, of the primary particles have a diameter greater than about 40 percent of the average diameter and less than about 160 percent of the average diameter.

6. The material of claim 1 wherein the particles include effectively no primary particles with a diameter greater than about a factor of four times the average particle size.

7. The material of claim 1 wherein the particles have an average secondary particle diameter less than about 100 nm, the particles being located within pores of a material in the layer.

8. The material of claim 1 wherein the particles comprise a metal oxide.

9. The material of claim 1 wherein the compositions are attached to the surface with a linker molecule.

10. The material of claim 9 wherein the linker molecule comprises an organic compound with two functional groups.

11. The material of claim 1 wherein the particles are fluorescent particles or phosphorescent particles.

12. The material of claim 1 wherein the composition comprises a metal.

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605 13. The material of claim 1 wherein the composition comprises a biological macromolecule.

1485 14. The material of claim 1 wherein the composition has a high index of refraction.

same materials = same index of refraction

15. A material comprising a self-assembled formation of inorganic particles, the inorganic particles having an average primary particle diameter less than about 100 nm and the particles comprising a composition selected from the group consisting of metal/silicon oxides, metal/silicon carbides, metal/silicon nitrides and elemental metal.

16. The material of claim 15 wherein the primary particles have a distribution in sizes such that at least about 95 percent, of the primary particles have a diameter greater than about 40 percent of the average diameter and less than about 160 percent of the average diameter.

41. The material of claim 1 wherein the inorganic particles have an average primary particle diameter from about 2 nm to about 100 nm.

42. The material of claim 1 wherein the inorganic particles have an average primary particle diameter from about 12 nm to about 50 nm.

43. The material of claim 1 wherein the particles are in an ordered array within at least one of the self-assembled islands.

44. The material of claim 1 wherein the plurality of islands are located along different layers within the material.

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45. The material of claim 15 wherein effectively no primary particles have a diameter greater than about a factor of four times the average primary particle size.

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46. The material of claim 15 wherein the inorganic particles have an average primary particle diameter from about 2 nm to about 50 nm.

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47. The material of claim 15 wherein the inorganic particles have an average secondary particle diameter from about 20 nm to about 400 nm.

48. The material of claim 15 wherein the inorganic particles are in an ordered array within the self-assembled formation.

49. The material of claim 15 wherein the self-assembled formation is integrated into an integrated assembly.

50. The material of claim 15 wherein the inorganic particles comprise a metal oxide.

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51. The material of claim 15 wherein the inorganic particles comprise a phosphor composition.

52. The material of claim 15 wherein the inorganic particles comprise a material with an index of refraction suitable for transmitting visible light.